

REMARKS

Consideration of the above-identified application in view of the foregoing amendments and following remarks is respectfully requested.

A. Status of the Claims and Explanation of Amendments

Claims 1-30 were pending. Although each of the pending claims was found to be novel, the previous Office Action had made a number of obviousness rejections pursuant to 35 U.S.C. § 103(a) as follows:

<u>Claims</u>	<u>Stated Rejection</u>
1-3, 29 and 30 ¹	allegedly unpatentable over U.S. Patent No. 6,819,779 to Nichani ("Nichani") in view of U.S. Patent No. 5,922,036 to Yasui et al. ("Yasui"). [10/5/07 Office Action at pp. 5-7].
4-5 and 11	allegedly unpatentable over Nichani in view of Yasui and further in view of U.S. Patent No. 6,501,856 to Kuwano et al. ("Kuwano"). [10/5/07 Office Action at p. 8].
6-9, 12-13, 16-18, 21-22 and 25-26	allegedly unpatentable over Nichani in view of Yasui and further in view of U.S. Patent Publ. 2003/0123706 to Stam et al ("Stam"). [10/5/07 Office Action at pp. 9-10].
14-15, 19-20, and 23-24	allegedly unpatentable over Nichani in view of Yasui and Kuwano, and further in view of Stam. [10/5/07 Office Action at pp. 10-12].
10, and 27-28	allegedly unpatentable over Nichani in view of Yasui and Stam, and further in view of U.S. Patent No. 5,550,717 to Liao ("Liao"). [10/5/07 Office Action at pp. 12-13].

Each of the Section 103 rejections is traversed below.

1 The statement of the rejection on page 5 refers only to claims 1-3. However, the discussion of the rejection includes claims 29 and 30. [See p. 7]. Accordingly, Applicant's have interpreted claims 29 and 30 as having been rejected in light of Nichani and Yasui. If something else was intended, the Examiner is requested to clarify the record.

In addition, claims 1-30 were rejected pursuant to 35 U.S.C. § 112, ¶2 as allegedly being indefinite. [10/5/07 Office Action at p. 4]. According to the Office Action, the phrase “the distribution of luminosity” in claim 1 had insufficient antecedent basis. By this paper, claim 1 is amended to recite “a” distribution of luminosity “of the pixels.” This amendment is not made for any substantial reasons related to patentability (§§ 102, 103). The rejection is respectfully asserted to be moot. Withdrawal of the rejection is requested.

Claim 1 also is amended to recite, *inter alia*, “calculating a number of the pixels of the image whose light decrease gradient is oriented from a left towards a center of the image and a number of the pixels of the image whose light decrease gradient is oriented from a right towards the center of the image.” Claims 4-7, 11-20, 29 and 30 also are amended for consistency with claim 1. Support for these claim amendments is found throughout the application as originally filed, including pages 10-11. No new matter will be added to this application by entry of these amendments. Entry is respectfully requested.

B. Claims 1-30 are Patentably Distinct from the Cited References

The Section 103 rejections of claims 1-30 are respectfully traversed. Each of the cited references fail to teach, disclose or suggest “calculating a number of the pixels ... whose light decrease gradient is oriented” either from the left toward the center or from the right toward the center as recited in Applicant’s claim 1. Accordingly, the requirements for setting for a *prima facie* rejection cannot be met. The rejections should be withdrawn.

The methods of both Nichani and Yasui (the primary and secondary references) differ significantly from Applicant’s claim 1. As discussed in Applicant’s specification, there are hazards associated relying upon lane markers to detect motor vehicle lanes. Yet, both

Nichani and Yasui are geared toward identifying lane markers and then defining a lane in accordance therewith. Applicant's claim 1 is directed to something different.

Specifically, Applicant's claim 1 recites:

"1. A method of detecting from a vehicle variations in path on a road having a surface and road edges comprising:

- at least partly illuminating a road scene near the vehicle;
- taking an image of a road scene having a plurality of pixels;
- determining, for each of the pixels in the image, a light decrease gradient;
- analyzing these light decrease gradients and determining an image of the road edges;
- calculating a number of the pixels of the image whose light decrease gradient is oriented from a left towards a center of the image and a number of the pixels of the image whose light decrease gradient is oriented from a right towards the center of the image; and
- determining an angle of a bend of the road by comparing a distribution of luminosity of the pixels."

Nichani is directed to a lane detection system that uses lane markers to determine the position of the vehicle on the roadway. [See, e.g., Nichani, Col. 3, lines 9-19]. A camera obtains image data. [Col. 2, lines 53-54]. That data is "recursively" processed "to produce a set of dense points along the boundary" of lane markers. [Col. 2, lines 59-67]. A "feature edge-detection algorithm" is used to "create[] a list of edges for all features detected in the image." [Col. 3, lines 1-5].

Next, individual lane markers are detected by analyzing the edge data with regard to width between edge pairs of the markers, opposite orientation of the intensity gradient angles of the edges, and absolute gradient angle orientation of the pair of edges. [Col. 3, lines 15-18].

Any pairs of edges that meet these criteria are deemed to be lane markers. [Col. 3, lines 20-22].

Finally, the detected lane markers are used to define a particular lane line and are fitted mathematically. [Col. 3, lines 24-34].

Nichani does not detect verges or edges of the road. Instead, Nichani detects lane markers by examining variations in light intensity in the sensed image.

The office action asserted that Nichani discloses “determining for each pixel in the image a light decrease gradient (edge processor used Sobel Edge detection which is a way of finding the gradient of the image; Col. 5, lines 35-41);” [10/5/07 Office action at p. 5].

The cited passage of Nichani relates to Figure 5, and points out that Sobel Edge detection is an “illustrative” type of edge detection that may be used:

“FIG. 5 is a block diagram of the various components of an image processor in an illustrative embodiment of the present invention. An edge processor 40 operates on image data 38 to distinguish features in an image. An illustrative embodiment of the invention uses a Patmax-style feature detection scheme using parabolic smoothing, non-integral sub-sampling at a specific granularity and Sobel Edge detection followed by true peak detection and finally chaining.”

There is no discussion in that passage or elsewhere in Nichani of an analysis of the number of the pixels whose light decrease gradient is oriented from the left towards the center or from the right towards the center. To the contrary, Nichani emphasizes the magnitude of the light gradient is the focus:

“Edge detection provides edges by selecting points in the image where the gradient *magnitude* is significant.” [Col. 5, lines 32-34 (emphasis added)].

Accordingly, Nichani fails to teach, disclose or suggest “calculating a number of the pixels of the image whose light decrease gradient is oriented from a left towards a center of

the image and a number of the pixels of the image whose light decrease gradient is oriented from a right towards the center of the image” as recited in Applicant’s claim 1.

Yasui is directed towards “a lane detection sensor,” “an arithmetic unit” and a “navigation system.” Yasui was cited by the Office Action to alleviate a deficiency in Nichani’s disclosure relating to the calculation of the curvature of the road. [10/5/07 Office Action at p. 6]. Without commenting on that allegation, Applicant notes that Yasui fails to alleviate the above-described deficiencies.

Yasui does not detect verges or edges of the road. Instead, Yasui detects lane markers by examining variations in light intensity in the sensed image, and then uses the lane markers to define a lane. First, an image is taken of the road ahead of a running motor vehicle. [Yasui, Col. 2, lines 53-54]. Second, “counter points” are extracted from that image data corresponding to the lane markers of the road. [Col. 2, lines 56-59]. Third, polynomial curves are fit to the detected contour points. [Col. 2, lines 59-62]. Fourth, Hough transformation calculations are made to detect a curve. [Col. 2, line 62-Col. 3, line 6].

In this process, Yasui does *not* analyze the number of the pixels whose light decrease gradient is oriented from the left towards the center or from the right towards the center. To the contrary, Yasui – like Nichani – detects “edges” by examining the intensity of the image data:

“In the contour point extracting means 3, an edge is obtained by using the image data of the road stored in the image data memory means 2 and a threshold value is set from edge intensity of the whole image so as *to find edge intensities exceeding initially the threshold value* by scanning the image upwardly from a bottom portion of the image and laterally in opposite directions from a center of the image such that the edge intensities are set as contour points of the right and left lane markers of the road.” [Col. 4, line 61- Col. 5, line 3 (emphasis added)].

This technique is consistently repeated in Yasui's specification. [Col. 6, lines 19-28 and Col. 7, lines 37-45]. Yasui defines edges of lane markers based on changes in intensity.

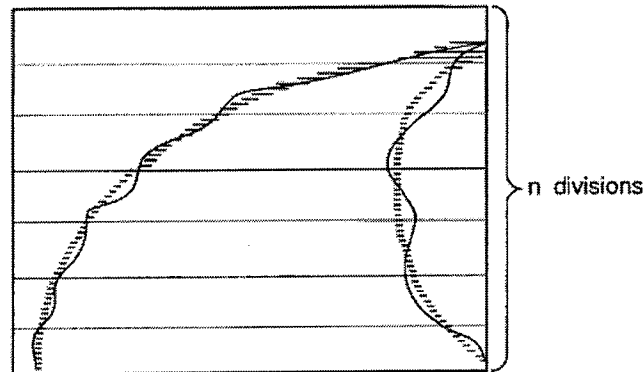
However, the Office Action alleged that Yasui teaches "generating a first curve corresponding to the number of the pixels having decrease vector oriented from the left of the image towards the center of the image, and generating a second curve corresponding to the number of the pixels having a decrease vector oriented from the left of the image towards the center of the image." [10/5/07 Office Action at p. 7 (citing Col. 6, lines 28-44)].

The cited passage in Yasui relates to the drawing of curves *after* contour points have been defined based on intensity changes:

"As shown in FIG. 6, the image is equally divided vertically into n sections by the divisional curve detecting means 14 and curves in the divided intervals of the image are obtained through spline interpolation by using the contour points referred to above.... By using the equations of the curves ... the resolution changing means 16 draws the curves on the image data so as to lower resolution of the image. In the curve contour point detecting means 17, edge intensity is again calculated from the image of the lowermost resolution and a threshold value is calculated from the edge intensity so as to obtain contour points of the lane markers of the road. In the overall curve detecting means 18, the lane markers of the overall image are obtained through spline interpolation." (Col. 6, lines 28-44)

This process of calculating polynomial curves by using the contour points corresponding to the lane markers of the road and then drawing those curves on the image data is shown in Figure 6 (reproduced below):

Fig.6



Yasui's curves are not generated through an analysis of light decrease gradient orientation. That is not discussed by Yasui.

Thus, Yasui fails to teach, disclose or suggest "calculating a number of the pixels of the image whose light decrease gradient is oriented from a left towards a center of the image and a number of the pixels of the image whose light decrease gradient is oriented from a right towards the center of the image" as recited in Applicant's claim 1.

Various tertiary references (Kuwano, Stam and Liao) also are cited in the Office Action in connection a number of features recited in the dependent claims. Without commenting on the specific assertions by the Office Action regarding those references, Applicant notes that none of those references teaches, discloses or suggests "calculating a number of the pixels of the image whose light decrease gradient is oriented from a left towards a center of the image and a number of the pixels of the image whose light decrease gradient is oriented from a right towards the center of the image" as recited in Applicant's claim 1.

Accordingly, as Applicant cannot find a disclosure of the calculating step of Applicant's claim 1 in any of the cited references, at least independent claim 1 is respectfully

asserted to be in condition for allowance. Dependent claims 2-30 are in condition for allowance for at least similar reasons.

Applicant has chosen in the interest of expediting prosecution of this patent application to distinguish the cited documents from the pending claims as set forth above. These statements should not be regarded in any way as admissions that the cited documents are, in fact, prior art. Likewise, Applicant has chosen not to swear behind the documents cited by the office action or to otherwise submit evidence to traverse the rejection at this time. Applicant, however, reserves the right, as provided by 37 C.F.R. §§ 1.131 and 1.132, to do so in the future as appropriate. Finally, Applicant has not specifically addressed the rejections of the dependent claims. Applicant respectfully submits that the independent claims, from which they depend, are in condition for allowance as set forth above. Accordingly, the dependent claims also are in condition for allowance. Applicant, however, reserves the right to address such rejections of the dependent claims in the future as appropriate.

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Paper dated April 7, 2008
Reply to Office Action dated October 5, 2007

CONCLUSION


For the above-stated reasons, this application is respectfully asserted to be in condition for allowance. An early and favorable examination on the merits is requested. In the event that a telephone conference would facilitate the examination of this application in any way, the Examiner is invited to contact the undersigned at the number provided.

THE COMMISSIONER IS HEREBY AUTHORIZED TO CHARGE ANY ADDITIONAL FEES WHICH MAY BE REQUIRED FOR THE TIMELY CONSIDERATION OF THIS AMENDMENT UNDER 37 C.F.R. §§ 1.16 AND 1.17, OR CREDIT ANY OVERPAYMENT TO DEPOSIT ACCOUNT NO. 13-4500, ORDER NO. 1948-4830.

Respectfully submitted,
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